

REMARKS

Claims 90, 92-115, and 144-147 are all the claims in the application. By this Amendment, Applicant amends claims 90, 95, and 102 for clarity.

I. Preliminary Matter

As a preliminary matter, Applicant again requests the Examiner to indicate acceptance of the drawings by marking box 10(a) on PTOI-326 form.

II. Professional Translation of the Imai Reference

As a courtesy to the Examiner and to further the prosecution of this application, Applicant submits herewith a professional translation of Imai (JP 11-229159). Applicant's response below is, therefore, based on the professional translation of Imai.

III. Prior Art Rejections

A. Claims 90 and 92-99 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Saito (JP 05-148615) in view of Imai (JP 11-229159). Applicant respectfully traverses these grounds of rejection at least in view of the following exemplary comments.

Of these rejected claims, claims 90 and 95 are independent. This Response initially focuses on claim 90.

Independent claim 90 recites forming the film using an electrode obtained by compression-molding powder with an average value of particle diameters not less than 10 nanometers and less than 1 micrometer.

The Examiner acknowledges that Saito does not disclose or suggest the above-noted features of claim 1 *i.e.*, a powder having an average grain diameter of 1 micrometer or less but alleges that Imai cures this deficiency. Specifically, the Examiner maintains that Imai describes the average grain diameter being a result effective variable (*see* page 20 of the Office Action). Applicant respectfully disagrees.

However, Imai discloses how an optimum electric discharge energy level is selected for particle diameters of 5 micrometer and 1 micrometer, respectively.

By contrast, claim 90 is directed to forming a film using an electrode obtained by compression-molding powder with an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer.

With respect to the diameter parameters, Imai discloses that what is necessary is to determine the optimal electrodischarge treatment energy from a point of thickness if electrodischarge treatment energy is chosen from a planar point from E1-E2 when particle diameter is 5 micrometers. On the other hand, with the electrodischarge treatment energy used when particle diameter was 5 micrometers, when particle diameter is 1 micrometer, since the shape of planarity of that to which thickness becomes thick gets worse, the electrodischarge treatment energy can form a good film by choosing out of E0-E1 (¶ 20).

In other words, as noted by the Examiner, Imai only describes selection of energy levels for particle diameter of 5 micrometers and 1 micrometer. Imai does not disclose or suggest the particle diameter being less than 1 micrometer. Furthermore, this is not a result effective variable, MPEP § 2144.05. Imai simply describes varying energy levels based on size of particle diameter but the smallest diameter Imai describes is 1 micrometer and not less than 1 micrometer. Since the size of the particle diameter impacts uniform hardness of the electrode, as described in an exemplary embodiment, it is not a result effective variable. The small size of the grain diameter is a unique feature of the claimed invention that provides a uniform electrode and is not a result-effective variable.

Furthermore, Imai discloses different particle diameters of the electrode and not of the metallic powders. Imai does not disclose or even remotely suggests the metallic powder having the particle diameter of less than 1 micrometer. This argument remains unrebutted by the Examiner. Applicant further respectfully notes that Saito describes the cover material e.g., the WC powder (mean particle diameter of 3 micrometers) is mixed with Fe powder (mean particle diameter of 9.8 micrometers), to form the green compact (¶ 27). That is, Saito only discloses the cover material having mean particle diameter of 3 micrometers and not metallic powder of the electrode being less than 1 micrometer. As such, taken together, Saito (which disclose cover material) in view of Imai (which describes particles but not metallic powder) cannot and do not describe the above-noted unique features of claim 90.

Also, Imai does not disclose or suggest the lower boundary being not less than 10 nanometers. Imai simply describes diameter sizes to provide an example of how the energy needs to be adjusted and not the actual diameter ranges for the particles. This argument remains unrebutted by the Examiner. Saito does not suggest a lower boundary for the powder diameter and clearly does not suggest the diameter of the powder being not less than 10 nanometers.

In short, Applicants respectfully submit that Saito in view of Imai do not describe the metallic powder having a grain diameter of less than 1 micrometer and not less than 10 nanometers. For at least these exemplary reasons, claim 90 is patentable over Saito in view of Imai. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claim 90 and its dependent claims 92-94.

Next, independent claim 95 recite features similar to, although not necessarily coextensive with, the features argued above with respect to claim 90. Therefore, arguments presented with respect to claim 90 are respectfully submitted to apply with equal force here. For at least substantially analogous exemplary reasons, therefore, independent claim 95 is patentable over Saito in view of Imai. Claims 96-99 are patentable at least by virtue of their dependency.

B. Claims 100, 102-108, 110-115, and 144-147 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Saito. Applicant respectfully traverses these grounds of rejection at least in view of the following exemplary comments.

Of these rejected claims, only claims 100 and 108 are independent. Independent claims 100 and 108 recite *inter alia* and in some variation recite: forming the film by using an electrode obtained by mixing a small-diameter powder having a distribution of small particle diameters and a large-diameter powder having an average particle diameter twice or more as large as the small-diameter powder and compression-molding the powders, the large-diameter powder being in 5 to 60 volume percent, and by using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers.

The Examiner acknowledges that Saito does not disclose the volume percent but alleges that the volume percent can be obtained by a routine experimentation (*see* pages 8-9 of the Office Action). The Examiner further appears to rely on Imai as showing same effect that large

particles require higher currents and mischaracterizes Applicant's arguments (*see* page 20 of the Office Action).

However, one of the features of claims 100 and 108 is that the large-diameter powder is in 5 to 60 volume percent. This is supported by the following description.

When a ratio of the large-diameter powder is less than 5%, expansion of the electrode is produced. However, the ratio is over 5%, the expansion of the electrode is not produced (English text, page 51-52). When a ratio of the large-diameter powder is larger than about 60%, density is deteriorated and the film has many spaces. When the ratio of large-diameter powder is smaller than about 60%, a dense film is formed (English text, page 54-56; FIGS. 15 and 16). That is, 5 to 60 volume percent of the large-diameter powder is essential. This cannot be obtained by a routine experimentation.

Additionally, Applicant respectfully notes that the relevance of Imai in this § 103(a) rejection over Saito *alone* is not understood. Also, Imai simply describes that larger particles naturally require higher energy levels but clearly does not address the criticality of a particular ratio. Clearly, Imai does not address the problem with large particles and large energy levels used, nor does it address the problem with small particle and the criticality of a particular ratio. An increase in discharge pulse is not what is driving a particular ratio and is not what is creating a critically of this ratio as mischaracterized by the Examiner.

Instead, in an exemplary embodiment, a uniform, dense film creates a criticality of the particular ratio (*e.g.* page 32 of the specification). In the present case, in an exemplary embodiment, it is described that when a ratio of the large-diameter powder 111 is too small, expansion of the electrode is not eliminated. However, when the large-diameter powder 111 with a volume percent of about 5% was mixed, large expansion of the electrode was eliminated. However, when the large-diameter powder 111 is increased, under the condition that energy of a discharge pulse is small, it is difficult to form a film. When a discharge pulse with large energy is used, surface roughness of a film is increased. Therefore, it is desirable to set a ratio of the large-diameter powder 111 as small as possible. When the large-diameter powder 111 has a small volume not more than 20%, a discharge pulse width was short and a *dense* film could be formed under a condition that a peak current value is low (pages 51 and 52 of the specification).

Furthermore, in an exemplary embodiment, concerning density of a film, when a volume percent of the large-diameter powder is larger than about 60%, density is deteriorated and the film has many spaces. In particular, when treatment is performed under a pulse condition with large energy, *spaces increase in the film* even if a ratio of large-diameter powder is reduced. However, when treatment is performed under a pulse condition with small energy, spaces in the film decrease and it is possible to form a dense film if the ratio of large-diameter powder is smaller than about 60%. That is, when the ratio of large-diameter powder is not more than 20%, spaces in the film are extremely small in number (Figs. 15 and 16; pages 54-56 of the specification).

It will be appreciated that the foregoing remarks relate to the invention in a general sense, the remarks are not necessarily limitative of any claims and are intended only to help the Examiner better understand the distinguishing aspects of the claim mentioned above.

In other words, Applicant respectfully submits that volume percent is a critical element and one of the unique features of the claimed invention.

Accordingly, forming the film by using an electrode obtained by mixing a small-diameter powder having a distribution of small particle diameters and a large-diameter powder having an average particle diameter twice or more as large as the small-diameter powder and compression-molding the powders, the large-diameter powder being in 5 to 60 volume percent, and by using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers, as set forth in claims 100 and 108 is not suggested by Saito and is not an optimum range obtained through a routine experimentation. For at least these exemplary reasons, Applicant respectfully requests the Examiner to withdraw this rejection of claims 100 and 108 and their dependent claims 102-107, 110-115, and claims 144-147.

In addition, dependent claim 102 recites: "the large-diameter powder has aspherical shape." For example, in a sixth exemplary embodiment, it is described that it is possible to form a dense electrode when it is molded from an aspherical powder as opposed to other shapes. That is, the prior art of record does not suggest the shape being aspherical (*see e.g.*, sixth embodiment and pages 48-52 of the specification). Accordingly, it is clearly not a matter of design choice but one of the unique features of the claimed invention.

Dependent claim 103 recites: “the small-diameter particle and the large-diameter particle have an identical component.” The Examiner now alleges that Saito teaches selecting appropriate materials to produce desired film and such selection is within the level of one of ordinary skill in the art (*see* pages 21-22). Applicant respectfully disagrees.

Applicant respectfully notes that although Saito describes mixing various different materials, there is no disclosure or even remote suggestion of mixing the same material that has different particle diameter. That is, Saito (as well as Imai) fails to recognize the importance of mixing a material of different diameters for improved density of the electrode. Accordingly, although Saito may describe using different materials, it clearly does not and would not describe using the same material of different diameters. In fact, the above-quoted features of claim 103 are unique features of the claim *e.g.*, pages 49-53 of the specification and are not an obvious variation. For at least these additional exemplary reasons, claim 103 is patentable over Saito.

C. Claims 101 and 109 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Saito in view of Imai further in view of Koizumi et al (EP 1035231, hereafter referred to as Koizumi). Applicant respectfully traverses these grounds of rejection at least in view of the following exemplary comments.

Claim 101 and 109 depend on claims 100 and 108, respectively. Applicant has already demonstrated that Saito does not meet all the requirements of independent claims 100 and 108. Imai, as noted above, does not cure these deficiencies. Koizumi is relied upon only for its alleged disclosure of grinding powders (*see* page 13 of the Office Action) and as such fails to cure the deficient disclosures of Saito and Imai. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claims 101 and 109. Since claims 101 and 109 depend on claims 100 and 108, respectively, they are patentable at least by virtue of their dependency.

D. Claims 144-147 are alternately rejected under 35 U.S.C. § 103(a) as being unpatentable over Saito in view of Liu (Powder Technology 126 (2002) 283-296). Applicant respectfully traverses these grounds of rejection at least in view of the following exemplary comments.

Claim 144-145 and 146-147 depend on claims 100 and 108, respectively. Applicant has already demonstrated that Saito does not meet all the requirements of independent claims 100 and 108. Liu is relied upon only for its alleged disclosure of particle packing (*see* page 13 of the Office Action) and as such fails to cure the deficient disclosures of Saito. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claims 100 and 108. Since claims 144-145 and 146-147 depend on claims 100 and 108, respectively, they are patentable at least by virtue of their dependency.

In addition, Applicant respectfully submits that Liu is only a theoretical paper that has not been implemented. That is, Liu does not and cannot enable one of ordinary skill in the art to produce the mixtures claimed in claims 144-147. This is evidenced at least by Table 1 of Liu (page 286), which shows what is intended by small and larger particles in the mixture (none of the particle sizes are below 1 micrometer).

It is a common method to use particles of different diameters in order to compress the particles in high density. An object of the present application is not to pack in particles but to form a dense film by melting particles, which is different from Liu. Further, Liu does not cure the above-identified deficiencies of Saito in that it too fails to disclose or suggest that the particle diameter are varied with respect to the same material. In short, claims 144-147 are patentable for at least these additional exemplary reasons.

IV. Double Patenting Rejections

A. *Claims 90-99 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of U.S. Patent No. 7,641,945 (hereafter referred to as '945).* Applicant respectfully disagrees.

Applicant respectfully notes that this rejection is based on a mere speculation and claims 1-7 of the '945 patent do not claim "compression-molding powder," "average value of particle diameter not less than 10 nanometers," and "forming a thick film with thickness not less than 100 micrometers". Since type of electrode, lower boundary of the particle diameter, and thickness of the coat is not claimed in the '945 patent, independent claims 90 and 95 are clearly

not obvious over the '945 patent. Claims 92-94 and 96-99 are not obvious by virtue of their dependency. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claims 90-99.

B. Claims 100, 102-108, 110-115, and 144-147 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of U.S. Patent 7,641,945 in view of Saito.

C. Claims 101 and 109 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of U.S. Patent 7,641,945 in view of Koizumi.

D. Claims 100, 102-106, 108, 110-114, and 144-147 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 76-78, 105 and 106 of copending Application No. 10/559,427 (hereinafter referred to as '427) in view of Saito.

E. Claims 90 and 92-99 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 76-78, 105 and 106 of copending Application No. 10/559,427 in view of Saito further in view of Imai.

F. Claims 101 and 109 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 76-78, 105 and 106 of copending Application No. 10/559427 in view of Saito and Koizumi.

G. Claims 100, 102-106, 108, 110-114, and 144-147 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 46, 51 and 52 of U.S. Patent No. 7,537,808 (which was previously used in the provisional double patenting rejection before it issued as Application 10/516,506) in view of Saito.

H. Claims 90 and 92-99 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 46, 51 and 52 of U.S. Patent No. 7,537,808 in view of Saito and Imai.

I. Claims 101 and 109 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 46, 51 and 52 of U.S. Patent No. 7,537,808 in view of Saito in view of Koizumi.

Applicant respectfully submits that as argued above with respect to the prior art rejections, Saito, Imai, and Koizumi do not describe the above-quoted unique features of at least claims 90, 95, 100, and 108. As such, these references do not cure the deficiencies of the '945 patent, the '427 application, and the '808 patent. Accordingly, Applicant respectfully requests the Examiner to withdraw these double patenting rejections.

VI. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly invited to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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